



2006 Minerals Yearbook

SOUTH AFRICA

THE MINERAL INDUSTRY OF SOUTH AFRICA

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The Republic of South Africa remained one of the world's leading mining and mineral-processing countries. In 2006, South Africa's share of world platinum production amounted to 77%; kyanite, 56%; chromite, 40%; vanadium, 40%; palladium, 39%; vermiculite, 38%; manganese, 20%; gold, 11%; fluorspar, 4%; antimony, 4%; aluminum, 3%; nickel, 3%; phosphate rock, 2%; and iron ore, 2%. The country's share of world reserves of platinum-group metals (PGM) amounted to 85%; zirconium, 37%; vanadium, 23%; fluorspar, 17%; rutile, 16%; gold, 14%; ilmenite, 10%; phosphate rock, 8%; manganese, 7%; and nickel, 6% (Carlin, 2007; Corathers, 2007; George, 2007a, b; Jasinski, 2007; Jorgenson, 2007; Kuck, 2007; Magyar, 2007; Miller, 2007; Papp, 2007; Plunkert, 2007; Potter, 2007a, b).

Minerals in the National Economy

The mining industry accounted for 7.9% of the gross domestic product in 2006; crude and processed mineral products accounted for nearly 40% of total exports. About 71% of crude mineral products and 72% of processed mineral products by value were exported in 2006. Employment in the South African mining industry amounted to 458,600 in 2006 compared with 444,132 in 2005. PGM mining accounted for 36.7% of the mining industry's employment; gold, 34.9%; coal, 12.6%; diamond, 4.4%; and other minerals, 11.4% (Mwape and others, 2007, p. 10, 12, 14, 16, 20).

Government Policies and Programs

The Mineral and Petroleum Resources Development Act of 2002 vested mineral ownership rights in the Government. Companies that owned mineral rights under previous legislation were required to convert their mineral rights to the new system within 5 years of the enactment of the new mining law. The Diamonds Act of 2005 was enacted in early 2006; this legislation was intended to promote domestic cutting and polishing of rough diamond (Mwape and others, 2007, p. 3-4).

The Government's Black Economic Empowerment program required that black ownership of the mining industry reach 15% by 2009 and 26% by 2014. Recent deals to increase black ownership included the acquisition of Wakefield Investments (Pty) Ltd. by Shanduka Group and the purchase of a 15% interest in the Marula PGM mine by Tubatse Platinum (Pty) Ltd. In 2006, 26% of Natal Portland Cement Company (Pty) Ltd. [a subsidiary of Cimentos de Portugal, SGPS, SA (Cimpor)] was purchased by the company's employee trust and black empowerment investment consortium Siyaka Cement Investment Holdings (Pty) Ltd. (Building Bulletin, 2007a; Mwape and others, 2007, p. 2).

Production

In 2006, titaniferous slag production increased by about 21%; lead mine, 15%; manganese metal, alloys, and

compounds, 14%; manganese ore, 13%; silicon metal and alloys, 12%; ferrochromium, 8%; zinc mine, 7%; zirconium mine, 6%; iron ore and vanadium, 5% each; and PGM, 2%. The output of crude petroleum declined by 39%; uranium, 20%; sulfur, 17%; natural gas, 13%; gold, 8%; vermiculite, 6%; diamond, 4%; and nickel, 2%. Chromite and coal output remained nearly unchanged (Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., August 13, 2007).

Structure of the Mineral Industry

Most of the South African mineral industry was privately owned. The production of gold and diamond, which were produced mostly by artisanal miners in many African countries, was dominated by large-scale producers in South Africa. The leading producer's share of total output varied sharply by commodity; the leading producer of diamond accounted for 96% of national production; iron ore, 75%; manganese ore, 49%; chromite, 42%; gold, 29%; and coal, 24%.

Mineral Trade

In 2006, exports of PGM amounted to \$7.9 billion; gold, \$5.41 billion; coal, \$3.18 billion; nickel, \$534 million; manganese ore, \$224 million; copper, \$157 million; chromite, \$73 million; silver, \$35 million; vermiculite, \$26 million; and other crude mineral products, which included diamond, ilmenite, rutile, and zircon, \$1.72 billion. Exports of ferrochromium amounted to \$1.53 billion; manganese metal and alloys, \$494 million; vanadium alloys and other vanadium products, \$391 million; silicon metal and alloys, \$119 million; and other processed mineral products, which included aluminum, \$2.16 billion (Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., August 13, 2007).

South Africa's imports of industrial minerals and processed industrial mineral products amounted to \$1.88 billion; ferrous metals and products, \$210 million; diamond, \$135 million; precious metals, \$130 million; other gemstones, \$92 million; coking coal, \$66 million; and nonferrous metals, \$29 million. In 2005, imports of crude petroleum amounted to \$6.07 billion (Mwape and others, 2007, p. 21).

Commodity Review

Metals

Aluminum.—South Africa produced primary refined aluminum from imported alumina. BHP Billiton plc of the United Kingdom operated the Bayside and Hillside primary aluminum smelters at Richards Bay. In 2006, production at Hillside increased to 704,000 metric tons (t) from 690,000 t

in 2005. Production at Bayside increased to 191,000 t from 161,000 t (BHP Billiton Group, 2006, 2007).

Chromium.—Xstrata plc of Switzerland and its joint-venture partners operated the Helena, the Horizon, the Kroondal, and the Thorncliffe Mines, which had a total capacity of 4.68 million metric tons per year (Mt/yr) of chromite. The company's production declined to 3.13 million metric tons (Mt) from 3.6 Mt in 2005. At the Kroondal Mines, production decreased to 1.63 Mt in 2006 from 1.86 Mt in 2005; output at the Thorncliffe Mine remained nearly unchanged at 1.2 Mt. The Helena Mine, which opened in 2006, produced 228,000 t. The Boshhoek and the Waterval Mines shut down in 2006 (Xstrata plc, 2007, p. 101).

Xstrata and its joint-venture partner Merafe Resources Ltd. operated the Boshhoek, the Lydenburg, the Rustenburg, and the Wonderkop ferrochromium plants. These plants had a total combined capacity of 1.62 Mt/yr. Production decreased at Rustenburg to 316,000 t in 2006 from 383,000 t in 2005, and at Wonderkop, to 249,000 t from 333,000 t. At Lydenburg and Boshhoek, production remained nearly unchanged at 379,000 t and 193,000 t, respectively. In the third quarter of 2006, Xstrata and Merafe started production at the Lion plant; output amounted to 44,000 t. The plant was expected to reach its full capacity of 360,000 metric tons per year (t/yr) in the second quarter of 2007 (Xstrata plc, 2007, p. 57-58, 101).

Samancor Chrome Ltd. (a subsidiary of Kermas Group Ltd.) produced an average of about 3 Mt/yr from the Eastern Chrome Mines in Mpumalanga Province and the Western Chrome Mines in North West Province. Production amounted to 3.2 Mt in 2005. About 2.3 Mt/yr of the company's output was consumed in its ferrochromium plants and 700,000 t/yr was sold in domestic and export markets. Samancor planned to increase chromite production to 10 Mt/yr by 2015 (Brown, 2006; Tran, 2007).

Samancor operated the Ferrometals plant in Witbank, the Middleburg Ferrochrome plant in Middleburg, and the Tubatse Ferrochrome plant in Steelpoort. The company's ferrochrome production amounted to about 1 Mt/yr. Samancor planned to increase output to 1.2 Mt/yr by the end of 2006, 1.5 Mt/yr by 2011, and 2.5 Mt/yr by 2015. Initial increases in production were likely to result from expansions of the Middleburg and the Steelpoort plants; Samancor also planned to build new ferrochromium plants. The cost of the new mines and smelters was estimated to be \$1.3 billion; expanding existing operations, \$100 million; and a new chrome chemicals plant, \$100 million (Brown, 2006; Metal Bulletin, 2006b).

Assmang Ltd. (African Rainbow Minerals Ltd. (ARM), 50%, and Assore Ltd., 50%) operated the Dwarsrivier Mine in Mpumalanga. In fiscal year¹ 2005-06, production declined to 526,000 t from 568,000 t in fiscal year 2004-05. The Dwarsrivier Mine had a capacity of 1.2 Mt/yr of run-of-mine ore; Assmang planned to increase capacity to 1.5 Mt/yr of run-of-mine ore (1.1 Mt/yr of salable ore) by 2009. Resources amounted to 71.8 Mt at a grade of 39.6% chromium oxide (Cr_2O_3), of which 30.2 Mt was reserves at a grade of 39.6% Cr_2O_3 (African Rainbow Minerals Ltd., 2006, p. 30, 37, 39).

Assmang produced ferrochromium at the Machadodorp plant in Mpumalanga Province with a capacity of 290,000 t/yr.

In fiscal year 2005-06, output decreased to 230,000 t from 266,000 t in fiscal year 2004-05 (African Rainbow Minerals Ltd., 2006, p. 36, 39).

ARM and its joint-venture partner LionOre Mining International Ltd. of Canada planned to open the Nkomati chrome mine by mid-2007. Production at the mine was expected to be 720,000 t/yr of chromite; the life of the mine was estimated to be 5 years (African Rainbow Minerals Ltd., 2006, p. 18).

In October 2006, ASA Metals (Pty) Ltd. was producing chromite at the rate of 420,000 t/yr from its Dilokong Mine at Burgersfort in Mpumalanga Province. ASA planned to increase output to about 650,000 t/yr by the end of 2006. The company was also producing ferrochromium at the rate of 120,000 t/yr in 2006; production in previous years was about 100,000 t/yr. ASA planned to add a new smelter that would increase ferrochromium production to 380,000 t/yr by 2008. The company planned a further expansion to 500,000 t/yr of ferrochromium in 2010 or 2011; increased ore supplies were to be obtained by deepening the Dilokong Mine (Markram, 2006).

Hernic Ferrochrome (Pty) Ltd. (a subsidiary of Mitsubishi Corp. of Japan) operated a ferrochromium plant with a capacity of 420,000 t/yr. The company mined chromite at the Maroelabult open pit mine from 1996 to 2000; shaft sinking at a new underground mine at Bokfontein was planned in mid-2008. The new mine was expected to have a capacity of 1.5 Mt/yr (Hernic Ferrochrome (Pty) Ltd., undated).

In late 2006, International Ferro Metals Ltd. (IFM) announced that its new chromite mine and ferrochromium plant in North West Province would start production in January 2007. The plant had a capacity of 267,400 t/yr; IFM had signed contracts with customers to purchase about 170,000 t/yr of the plant's output. Resources at the mine were estimated to be 45.9 Mt at a grade of 35.6% Cr_2O_3 , of which 13.02 Mt at a grade of 30.3% Cr_2O_3 was reserves. The project was expected to cost about \$170 million (Ferro-Alloys Monthly, 2006; Mining Magazine, 2006).

Tata Steel Ltd. of India planned to complete a new ferrochromium plant at Richards Bay in the fourth quarter of 2007. The plant was expected to have an initial capacity of 120,000 t/yr; Tata planned phased expansions to increase the capacity to 240,000 t/yr. The company planned to export most of the plant's output to stainless steel producers in Western Europe, the Republic of Korea, India, and Taiwan (Hindu, The, 2006).

Copper.—Rio Tinto plc operated the Palabora copper mine, smelter, and refinery. In 2006, mine production at Palabora increased to 66,202 t of copper from 65,892 t in 2005. The production of smelted copper decreased to 78,980 t in 2006 from 84,926 t in 2005, and the production of refined copper increased to 81,163 t from 80,319 t (Palabora Mining Company Ltd., 2007, p. 78-79).

Anglo American Platinum Corp. Ltd. (Anglo Platinum) produced 11,100 t of refined copper at Rustenburg Base Metal Refiners in 2006 compared with 11,300 t in 2005. About 10,100 t was attributable to the company's PGM mining operations compared with 10,500 t in 2005; the remainder was attributable to purchased concentrates (Anglo American Platinum Corp. Ltd., 2007, p. 86).

ARM produced 3,398 t of copper at the Nkomati nickel mine in fiscal year 2005-06. The company planned to increase

¹Fiscal years run from the end of June in one year through the end of June in the following year unless otherwise specified.

production to 12,000 t/yr of copper by fiscal year 2009-10 (African Rainbow Minerals Ltd., 2006, p. 18).

Gold.—The long-term decline in the country's gold output continued in 2006, with national gold mine production decreasing to 272,128 kilograms (kg) from 294,671 kg in 2005 (table 1). The decline was broadly based, with output decreasing from each of South Africa's five ranked gold producers (AngloGold Ashanti Ltd. and Gold Fields Ltd., 2008, p. 21).

AngloGold Ashanti Ltd. operated the Great Noligwa, the Kopanang, the Moab Khotsong, and the Tau Lekoa Mines in the West Wits area near Carletonville; and the Mponeng, the Savuka, and the Tau Tona Mines in the Vaal River area near Klerksdorp. AngloGold Ashanti's gold production declined to 79,430 kg in 2006 from 83,220 kg in 2005 (AngloGold Ashanti Ltd. and Gold Fields Ltd., 2008, p. 21).

At the Mponeng Mine, production increased to 18,500 kg in 2006 from 15,900 kg in 2005 because of higher volumes and ore grades. At the Tau Tona Mine, lower volumes and seismicity concerns led to a decrease in production to 14,700 kg from 15,600 kg. Output declined to 2,800 kg from 3,900 kg at Savuka; the planned closure of the mine was postponed from 2006 to 2010 because of higher gold prices. In 2007, production at the Mponeng Mine was expected to be about 17,100 kg, and at Tau Tona, about 14,600 kg. In early 2007, AngloGold Ashanti planned to make a decision on a project that would deepen the Mponeng Mine and postpone its closure from 2018 to 2024. Output at Savuka was expected to be about 2,200 kg in 2007 (Mining Review Africa, 2006b; AngloGold Ashanti Ltd., 2007, p. 48-51).

In 2006, production at the Great Noligwa Mine declined to 19,100 kg from 21,600 kg in 2005 because of lower ore grades; production also decreased at Tau Lekoa and Kopanang. In 2007, production at Great Noligwa was expected to be about 18,000 kg. At Kopanang, output was expected to increase to about 14,600 kg in 2007 from 13,900 kg in 2006; and at Tau Lekoa, to decline to 5,000 kg from 5,500 kg. The Moab Khotsong Mine produced about 2,500 kg of gold in 2006; AngloGold Ashanti planned to increase output to 15,400 kg by 2012. The life of the mine was expected to be 15 years (AngloGold Ashanti Ltd., 2007, p. 51-54).

Harmony Gold Mining Company Ltd. of South Africa mined gold at numerous mines that included the Elandsrand, the Evander, the Kalgold, the Orkney/Welkom, and the Randfontein. The company's production of gold was 65,580 kg in 2006 compared with 72,430 kg in 2005. Harmony planned to increase its gold production to more than 93,000 kilograms per year (kg/yr) by 2010; new projects included the Tshepong Decline in February 2008; the Phakisa Shaft in February 2009; the Doorknop South Reef in June 2010; and the deepening of the Elandsrand Mine in December 2010 (African Rainbow Minerals Ltd., 2006, p. 53; Harmony Gold Mining Company Ltd., 2006; AngloGold Ashanti Ltd. and Gold Fields Ltd., 2008, p. 21).

Gold Fields Ltd. of South Africa produced gold at the Beatrix, the Driefontein, and the Kloof Mines; the company's output declined to 80,617 kg in 2006 from a revised 85,298 kg in 2005. Production at the Driefontein Mine declined to 33,419 kg in 2006 from a revised 36,432 kg in 2005; at the Kloof Mine, to 28,501 kg from a revised 29,887 kg, and at the Beatrix Mine, to 18,697 kg from a revised 18,979 kg (Gold Fields Ltd., 2007).

Gold Fields planned to spend \$455 million on a deepening of the Driefontein Mine that would extend its life by at least 13 years to about 2035. The company expected to start shaft sinking in October 2007; full production from the project was expected by 2019. The project could result in the production of an additional 270,000 kg of gold. Gold Fields also planned to invest \$193 million on a deepening of the Kloof Mine that would increase gold production by an additional 62,000 kg between 2011 and 2021 (Mining Review Africa, 2006a).

Placer Dome Inc. of Canada produced gold at the South Deep Mine. In 2006, output was 9,420 kg compared with 14,342 kg in 2005. In January, Placer Dome's board of directors approved a bid by Barrick Gold Corp. of Canada to purchase the company. In September, Gold Fields announced plans to purchase Barrick's share in South Deep. Gold Fields planned to increase production at South Deep to nearly 25,000 kg/yr (Metal Bulletin, 2006a; AngloGold Ashanti Ltd. and Gold Fields Ltd., 2008, p. 21).

In 2006, gold production by Durban Roodepoort Deep Ltd. (DRD) of South Africa declined to 11,058 kg from a revised 13,590 kg in 2005. Output at the Blyvooruitzicht Mine amounted to 4,844 kg in 2006; the Crown Mine, 3,241 kg; and the East Rand Proprietary Mine (ERPM), 2,943 kg. DRD was engaged in an exploration program at ERPM that could extend the mine's life to 2020 from 2009 (Durban Roodepoort Deep Ltd., 2007a, b).

Thistle Mining Inc. of South Africa operated the President Steyn Mine in Free State. The company produced 4,544 kg of gold compared with 5,430 kg in 2005; production was disrupted for 5 months by an accident. Thistle planned to produce about 4,400 kg of gold in 2007 (Thistle Mining Inc., 2007, p. 3, 27-28).

Anglo Platinum's production of refined gold from Rustenburg Base Metal Refiners declined to 3,534 kg in 2006 from 3,655 kg in 2005. Of this amount, 3,182 kg was attributable to Anglo Platinum's PGM mining operations in 2006 compared with 3,359 kg in 2005; the remainder was attributable to purchased concentrates (Anglo American Platinum Corp. Ltd., 2007, p. 86).

In May 2006, Aflase started construction on the Modder East underground mine, which is located 30 kilometers (km) east of Johannesburg. The capital costs for developing the mine were estimated to be about \$108 million. Production was expected to start in October 2008; Aflase planned to produce an average of 3,400 kg/yr of gold between 2010 and 2015. The life of the mine was likely to be 10 years (Uranium One Inc., 2006).

First Uranium Corp. of Canada (a subsidiary of Simmer and Jack Mines Ltd.) planned to produce an average of 10,000 kg/yr of gold at the Ezulwini Mine between 2009 and 2024; the mine was expected to open in October 2007. The company also planned to produce an average of 4,500 kg/yr of gold at the Buffelsfontein Mine (formerly known as the North West Mine) between 2010 and 2021; production was expected to start in 2008. Simmer and Jack acquired Buffelsfontein from DRD in 2005 (First Uranium Corp., 2007).

South Africa's production of refined gold declined to 427,313 kg in 2006 from 451,533 kg in 2005 and 445,300 kg in 2004. The decline was attributable to the shutdown of the refinery operated by Musuku Beneficiation Systems (Pty) Ltd., which

was a subsidiary of Harmony. Musuku produced 29,170 kg of gold in 2006 compared with 62,820 kg in 2005 (AngloGold Ashanti Ltd. and Gold Fields Ltd., 2008, p. 7, 29).

Rand Refinery Ltd. in Germiston (AngloGold Ashanti, 53%; Gold Fields, 33%; DRD, 10%; Avgold Ltd., 2%; and Western Areas Ltd., 2%) produced 394,053 kg of refined gold in 2006 compared with 384,811 kg in 2005. About 61% of the refinery's gold was sourced from South African mines, and 37%, from mines in other countries. Ghana accounted for 51% of Rand's imports; Mali, 18%; Zimbabwe, 9%; Tanzania, 8%; Guinea, 6%; and other countries, 8%. The remainder of South Africa's refined gold was produced by seven small gold recycling companies (AngloGold Ashanti Ltd. and Gold Fields Ltd., 2008, p. 27-28).

Iron and Steel.—Mittal Steel South Africa Ltd. accounted for most of South Africa's production of crude steel at its Newcastle, Saldanha, Vanderbijlpark, and Vereeniging plants. The production of crude steel at Vanderbijlpark decreased to 3.67 Mt in 2006 from 3.82 Mt in 2005 because of mechanical problems and shortages of iron ore. At Saldanha, production declined to 1.2 Mt in 2006 from 1.25 Mt in 2005 because of problems with power supply. Output remained nearly unchanged at Newcastle and Vereeniging (Mittal Steel South Africa Ltd., 2007, p. 29, 34).

Mittal planned to increase crude steel production at Vanderbijlpark by about 1.9 Mt/yr by the end of 2009 and 2.3 Mt/yr by 2012. By February 2007, the company planned to increase production at Vanderbijlpark by 445,000 t/yr by relining blast furnace D, and gain an additional 660,000 t/yr from increased efficiency. The installation of new direct-reduced iron kilns was expected to increase output by 325,000 t/yr by the second half of 2007 and by 830,000 t/yr by the second half of 2009. By 2012, Mittal planned to increase production by 355,000 t/yr by relining blast furnace C. The estimated cost of the expansion at Vanderbijlpark was about \$700 million from 2006 to 2009. The company also planned to increase capacity at Saldanha and Vereeniging by a combined 105,000 t/yr (Mittal Steel South Africa Ltd., 2005, p. 5, 7; 2007, p. 19).

Highveld operated a steel mill at Witbank. In 2006, the company's production of crude steel was 777,017 t compared with 787,589 t in 2005 and 849,554 t in 2001. Scaw Metals [a subsidiary of Anglo American plc (Anglo American)] also produced crude steel at its Germiston plant (Highveld Steel and Vanadium Corp. Ltd., 2007, p. 3).

Iron Ore.—Assmang, Highveld Steel and Vanadium Corp. Ltd. of South Africa, and Kumba Iron Ore Ltd. of South Africa mined iron ore. In 2006, Kumba Resources Ltd. was reorganized; the iron ore assets were put under Kumba Iron Ore, and the coal, industrial minerals, mineral sands, and zinc assets became Exxaro Resources Ltd. Kumba operated the Sishen Mine in Northern Cape Province and the Thabazimbi Mine in Limpopo Province. In 2006, output from the Sishen Mine increased to 28.7 Mt from nearly 28.5 Mt in 2005. Production at Thabazimbi declined to 2.42 Mt from 2.53 Mt (Kumba Iron Ore Ltd., 2007, p. 27-28).

In 2006, exports accounted for 79% of Kumba's iron ore sales, and domestic consumers, 21%. China accounted for 35% of Kumba's iron ore exports; Europe, 35%; and Japan, 23%. Kumba's share of the world's seaborne iron ore trade amounted to 3% (Kumba Iron Ore Ltd., 2007, p. 19).

Kumba planned to complete an expansion of the Sishen Mine by the beginning of 2009. The expansion was likely to increase salable iron ore production by 13 Mt/yr; the increase would be at least partially attributable to improved beneficiation technology. The cost of the expansion was expected to be about \$1.15 billion. Kumba was conducting a prefeasibility study on the expansion of the Sishen Mine by an additional 10 to 20 Mt/yr; the company planned to complete the study in 2007. Resources at Sishen were estimated to be 2.45 billion metric tons at a grade of 58.7% iron (Kumba Iron Ore Ltd., 2007, p. 31-32, 35).

Kumba was carrying out a feasibility study on the Sishen South project, which is located 90 km south of the Sishen Mine. Depending upon favorable results of the study, Sishen South was expected to produce 9 Mt/yr of iron ore. The company planned to complete the feasibility study in the second quarter of 2007. Resources at Sishen South were estimated to be 373 Mt at a grade of 64.7% iron (Kumba Iron Ore Ltd., 2007, p. 31, 35).

Kumba was also conducting a feasibility study on the Phoenix project at the Thabazimbi Mine, which would maintain production at 2.4 Mt/yr and extend the life of the mine to 30 years from 4 years. The company planned to complete the feasibility study in the second quarter of 2007 (Kumba Iron Ore Ltd., 2007, p. 31-32, 35).

Assmang produced iron ore at the Beeshoek Mine in Northern Cape, which had a rated capacity of 6 Mt/yr. In fiscal year 2005-06, production declined to 5.54 Mt from 6.43 Mt in fiscal year 2004-05 (African Rainbow Minerals Ltd., 2006, p. 30, 32, 65).

Assmang was considering the development of the iron ore resources at the Bruce, King, and Mokaning properties (BKM). If development of BKM proceeded, a new mine was expected to be completed in fiscal year 2007-08 at a cost of \$446 million. Exports from the Beeshoek Mine were expected to decline to less than 1 Mt/yr by fiscal year 2008-09. Assmang's total iron ore exports were likely to be about 9 Mt in fiscal years 2007-08 and 2008-09. The company was also considering an expansion of BKM's capacity to 16.8 Mt/yr from 8.4 Mt/yr in fiscal year 2009-10 at a cost of \$223 million (African Rainbow Minerals Ltd., 2006, p. 30-31, 33-34, 67).

Highveld mined titaniferous magnetite at its Mapochs open pit mine near Roosenekal in the Mpumalanga Province. In 2006, the company produced 2.1 Mt of ore compared with 2.07 Mt in 2005 and 2.36 Mt in 2001 (Highveld Steel and Vanadium Corp. Ltd., 2007, p. 3).

Lead and Zinc.—Anglo American operated the Black Mountain lead-zinc-copper mine near Aggeneys in Northern Cape Province. In 2006, production amounted to 34,100 t of zinc and 48,300 t of lead from 1.4 Mt of ore milled compared with 32,100 t of zinc and 42,200 t of lead from 1.35 Mt of ore milled in 2005 (Anglo American plc, 2007, p. 153).

Zinc Corp. of South Africa Ltd. (a subsidiary of Exxaro Resources Ltd.) operated South Africa's only zinc refinery at Springs. In 2006, production declined to 90,000 t from 102,000 t in 2005 because of lower-quality concentrates from the refinery's main suppliers (Exxaro Resources Ltd., 2007, p. 5, 31).

Manganese.—Samancor Manganese (Pty) Ltd. (BHP Billiton, 60%, and Anglo American, 40%) operated the Mamatwan open pit mine and the Wessels underground mine

near Hotazel in Northern Cape Province. In 2006, Samancor's production of manganese ore increased to 2.51 Mt from 2.33 Mt in 2005. The company's ferromanganese and silicomanganese plant at Meyerton was South Africa's leading producer of manganese alloys. In 2006, output of manganese alloys was 469,000 t compared with 419,000 t in 2005 (BHP Billiton Group, 2006, 2007).

Manganese Metal Company (Samancor Manganese, 51%) operated the Krugersdorp and the Nelspruit plants, which produced manganese metal. The Krugersdorp plant shut down in 2006 (Ryan's Notes, 2006b).

Assmang produced manganese ore at the Gloria and the Nchwaning Mines. Capacity at Nchwaning was 3 Mt/yr, and at Gloria, 600,000 t/yr. In fiscal year 2005-06, production at the mines increased to 2.57 Mt from 1.81 Mt in fiscal year 2004-05. Reserves at Nchwaning were estimated to be 117 Mt at a grade of 44.9% manganese and at Gloria, 75.3 Mt at a grade of 38.2% manganese (African Rainbow Minerals Ltd., 2006, p. 30, 35-36, 61-62).

Assmang operated the Cato Ridge ferromanganese plant in Kwa-Zulu Natal, which had a capacity of 300,000 t/yr. In fiscal year 2005-06, output increased to 260,000 t from 197,000 t in fiscal year 2004-05. Assmang was considering an increase in Cato Ridge's capacity to 380,000 t/yr (African Rainbow Minerals Ltd., 2006, p. 35-36)

Highveld produced ferromanganese and silicomanganese at its plant at Witbank. In 2006, Highveld's manganese alloy output increased to 136,573 t from 126,439 t in 2005 (Highveld Steel and Vanadium Corp. Ltd., 2007, p. 3).

Renova Group of Russia was engaged in a joint-venture agreement with domestic companies Chancellor House and Pitsoe ya Setshaba to develop the Kalahari manganese ore deposit. By the second quarter of 2007, Renova planned to complete a feasibility study on mining at Kalahari. Depending on favorable results of the study, the company planned to build a mine to produce between 1.5 and 2 Mt/yr of manganese ore. The mine was expected to be completed in 5 years. Renova also planned to build a ferromanganese plant at the Coega Industrial Development Zone in Eastern Cape Province. The plant, which had a planned capacity of 300,000 t/yr, was expected to be completed in 3 years (Metal Bulletin, 2006c; Ryan's Notes, 2006a).

Nickel.—Most of South Africa's nickel mine production was a coproduct of PGM mining. Anglo Platinum produced 21,300 t of refined nickel at Rustenburg Base Metal Refiners in 2006 compared with 20,500 t in 2005. About 19,200 t was attributable to the company's PGM mining operations compared with 19,000 t in 2005 (Anglo American Platinum Corp. Ltd., 2007, p. 86).

In fiscal year 2005-06, Implats produced 7,700 t of refined nickel from its refinery northeast of Johannesburg compared with 8,100 t in fiscal year 2004-05. Production at this plant was from purchased concentrates and toll refining. Implats also produced nickel from its Impala PGM mines near Rustenburg in North West Province; production of refined nickel from Impala remained unchanged at 7,900 t (Impala Platinum Holdings Ltd., 2006, p. 39, 63).

ARM produced 5,616 t of nickel at the Nkomati Mine in fiscal year 2005-06. The company planned to increase production to 21,500 t/yr of nickel by fiscal year 2009-10. Reserves at

Nkomati were estimated to be 66.3 Mt at a grade of 0.48% nickel. The life of the mine was expected to be 20 years (African Rainbow Minerals Ltd., 2006, p. 18, 71).

Platinum-Group Metals.—In 2006, Anglo Platinum produced 162,900 kg of refined PGM compared with 144,700 kg in 2005. About 144,400 kg was attributable to the company's mining operations in 2006 compared with 131,600 kg in 2005. Platinum produced from Anglo's mining operations amounted to 78,000 kg; palladium, 42,200 kg; and rhodium, 8,900 kg (Anglo American Platinum Corp. Ltd., 2007, p. 86).

In 2006, output by Anglo Platinum at Rustenburg increased to about 51,100 kg of PGM from 46,600 kg in 2005; at Amandelbult, to 35,452 kg from 30,883 kg; and at Bafukeng Rasimone Platinum Mine (BRPM), to 11,863 kg from 9,546 kg. Production at the Kroondal Mine (a joint venture with Aquarius Platinum Ltd. of South Africa) increased to 13,866 kg of PGM from 13,009 kg in 2005; platinum production increased to 8,307 kg from 7,782 kg. At PPRust, PGM production declined to 13,067 kg from 13,791 kg. The Mototolo Mine (a joint venture with Xstrata) started production in 2006; PGM output amounted to 426 kg (Anglo American Platinum Corp., 2007, p. 89-90, 92, 94, 99; Aquarius Platinum Ltd., 2006, p. 5; 2007, p. 6).

Anglo Platinum planned to increase PGM production at Mototolo to about 3,400 kg in 2007; output was likely to be 4,000 kg/yr when the project reached full production. The company also planned to increase production at PPRust by 132% starting in early 2008. At Rustenburg, production was expected to increase by between 8% and 14% starting in 2008. Anglo Platinum planned to increase output at Amandelbult by 5% in 2007 and by 23% starting in 2012 (Anglo American Platinum Corp. Ltd., 2007, p. 36, 38, 45, 54, 92).

Implats operated the Impala Mines near Rustenburg in North West Province and the Marula Mine in Limpopo Province. In fiscal year 2005-06, production of refined PGM at Impala was 62,297 kg compared with 64,132 kg in fiscal year 2004-05; platinum production increased to 35,001 kg from 34,668 kg. Higher output was attributable to an increase in the amount of ore milled. Implats planned to maintain production at about 34,000 kg/yr of platinum for the 30-year life of the mines. In fiscal year 2005-06, the company increased the capacity of the Precious Metals Refinery to more than 62,000 kg/yr of refined platinum and decided to expand the capacity to 71,500 kg/yr by 2008. Implats commenced studies on further increases in the refinery's capacity initially to 78,000 kg/yr and subsequently to 87,000 kg/yr (Impala Platinum Holdings Ltd., 2006, p. 39, 46-47).

In fiscal year 2005-06, platinum production at Marula increased to 1,244 kg from 927 kg in fiscal year 2004-05 because of an increase in ore milled. Implats planned to increase platinum production at Marula to 1,900 kg in fiscal year 2006-07, 2,900 kg in fiscal year 2007-08, and 4,200 kg in fiscal year 2008-09 (Impala Platinum Holdings Ltd., 2006, p. 52).

Implats also operated a refinery located northeast of Johannesburg; production at this plant was from purchased concentrates and toll refining. In fiscal year 2005-06, the refinery's production remained nearly unchanged at 46,245 kg of PGM. Implats planned to increase production in fiscal year 2006-07 (Impala Platinum Holdings Ltd., 2006, p. 63-64).

African Rainbow Minerals and Implats were engaged in a joint venture to develop the Two Rivers Mine in Mpumalanga Province. The mine was expected to reach its full capacity of 3,700 kg/yr of platinum, 2,100 kg/yr of palladium, and 600 kg/yr of rhodium in fiscal year 2007-08. Capital costs of the project were likely to be about \$181 million. African Rainbow Minerals also planned to produce 4,000 kg/yr of PGM with the expansion of the Nkomati nickel mine; output amounted to 1,538 kg in fiscal year 2005-06 (African Rainbow Minerals Ltd., 2006, p. 18, 23).

Lonmin plc of the United Kingdom mined PGM at the Eastern Platinum Mine, the Karee Mine, and the Western Platinum Mine, which are located east of Rustenburg in North West Province, and at the Limpopo Mine. From September 2005 to September 2006, these mines produced 30,068 kg of platinum compared with 28,938 kg in the previous 12 months. Total production of PGM increased to 57,889 kg from 54,957 kg. The Limpopo Mine produced 3,526 kg of PGM that included 1,568 kg of platinum (Lonmin plc, 2006, p. 28).

Lonmin planned to increase platinum production at the Eastern Platinum, the Karee, and the Western Platinum Mines to 31,000 kg in 2010 and to 36,500 kg in 2012. The Limpopo Mine was expected to produce 2,700 kg in 2009; the Limpopo Phase 2 project could increase output to 5,600 kg in 2012. The Pandora project could start in 2011 and produce 1,700 kg in 2012. In 2006, the Limpopo Phase 2 and Pandora projects were in the prefeasibility stage. Lonmin also planned to increase its platinum smelting capacity to about 43,500 kg/yr in 2010; a subsequent expansion to 62,000 kg/yr was in the prefeasibility stage (Lonmin plc, 2006, p. 6-7).

Aquarius operated the Marikana Mines. In 2006, production of PGM at Marikana was 3,351 kg compared with 3,159 kg in 2005; platinum production rose to 2,017 kg from 1,999 kg. Output at Marikana was expected to increase to a rate of 2,800 kg/yr of platinum and 1,300 kg/yr of palladium by the end of 2006. The Everest Mine produced 5,373 kg of PGM in 2006. The company planned to increase production at Everest to 7,000 kg/yr of PGM (Anglo American Platinum Corp. Ltd., 2007, p. 17; Aquarius Platinum Ltd., 2006, p. 2, 7, 9; 2007, p. 2, 9).

Silicon.—In 2006, South Africa's production of silicon metal and ferrosilicon increased to more than 200,000 t from 180,494 t in 2005. Silicon Smelters (Pty) Ltd. was the only domestic producer of silicon metal. In 2006, Highveld produced 51,057 t of ferrosilicon compared with 42,656 t in 2005 from its plant at Witbank. Silicon Technology (Pty) Ltd. also produced ferrosilicon (Highveld Steel and Vanadium Corp. Ltd., 2007, p. 3).

Titanium and Zirconium.—In 2006, Exxaro produced 319,000 t of ilmenite from the Hillendale Mine in KwaZulu Natal Province compared with 356,000 t in 2005. Rutile production increased to 25,000 t from 23,000 t, and zircon, to 50,000 t from 47,000 t. In 2006, Exxaro approved construction of the Fairbreeze Mine; production was expected to start in 2008 if the necessary mining and environmental permits were acquired. The life of the Fairbreeze Mine was estimated to be more than 25 years (Exxaro Resources Ltd., 2007, p. 5, 30).

Anglo American mined ilmenite, rutile, and zircon at its Namakwa Sands project on South Africa's western coast. Ilmenite production at Namakwa Sands declined to 272,200 t

in 2006 from 316,100 t in 2005, and rutile, to 28,200 t from 29,100 t. Zircon output remained nearly unchanged at 128,400 t. By 2008, Anglo American planned to complete a \$43 million expansion to increase zircon and rutile output to about 150,000 t and 37,000 t, respectively (Mining Magazine, 2006).

Vanadium.—Highveld produced vanadium from titaniferous magnetite ore at the Mapochs Mine. In 2006, the company produced 64,964 t of vanadium slag compared with 66,750 t in 2005; the average vanadium pentoxide (V_2O_5) content of the slag amounted to about 22% between 2001 and 2005. Highveld produced 7,572 t of vanadium in ferrovanadium in 2006 compared with 8,565 t in 2005; the company also produced V_2O_5 and various vanadium chemicals for sale. Highveld announced plans to increase its production of vanadium by 15% over the next few years (Highveld Steel and Vanadium Corp. Ltd., 2007, p. 3, 19).

Xstrata produced V_2O_5 at Rhovan in Brits; output increased to 9,819 t of V_2O_5 from 9,146 t in 2005. Higher production was attributable to the use of vanadium-rich spinel. Ferrovanadium production at Rhovan increased to 4,907 t in 2006 from 4,592 t in 2005. The plant had a capacity of 10,600 t/yr of V_2O_5 ; Xstrata planned to increase capacity by about 3,900 t/yr. The development of the project depended upon approval by Xstrata's Board of Directors and Government regulatory agencies (Xstrata plc, 2007, p. 58-59, 101).

Vametco operated a mine in Brits with a capacity of 5,400 t/yr of V_2O_5 (table 2). In August 2006, Evraz Group S.A. purchased a 73% share in Strategic Minerals Corp. of the United States, which was Vametco's parent company (Strategic Minerals Corp., 2006).

Pinnacle Resources Inc. of the United States planned to produce 6,000 t/yr of V_2O_5 from about 770,000 t/yr of magnetite ore at its property northwest of Mokopane in Limpopo Province. Resources were estimated to be 419 Mt that contained 6.4 Mt of V_2O_5 . The cost of the project was estimated to be \$106 million; Pinnacle was seeking joint-venture partners in 2006 (Pinnacle Resources Inc., 2006).

Industrial Minerals

Cement.—Domestic cement consumption increased to 12.7 Mt in 2006 from 11.4 Mt in 2005 because of infrastructure development and residential construction. Cement demand was expected to increase to 17 Mt by 2010. Cement producers invested about \$650 million in capacity expansions in 2006 to alleviate shortages (Baloyi, 2007; Building Bulletin, 2007b; Cimentos de Portugal, SGPS, SA, 2007, p. 69-70).

Pretoria Portland Cement Co. (Pty) Ltd. (PPC) was South Africa's leading cement producer. By April 2008, PPC planned to increase its capacity to 8 Mt/yr by expanding its Dwaalboom plant. Lafarge South Africa Ltd. expected to increase its capacity at Lichtenburg to 3.7 Mt/yr from 2.7 Mt/yr in 2008. Cimpor operated the Simumu plant, which produced at its full capacity of nearly 1.06 Mt/yr in 2006. By the fourth quarter of 2007, Cimpor planned to increase capacity at Simumu to 1.7 Mt/yr. Holcim South Africa Ltd. also planned to upgrade its Dudfield plant (Baloyi, 2007; Cimentos de Portugal, SGPS, SA, 2007, p. 69-70).

Diamond.—De Beers Group accounted for most of South Africa's rough diamond production. In 2006, the company's output declined to nearly 14.57 million carats from 15.16 million carats in 2005. At Venetia, production declined to 8.12 million carats from 8.52 million carats, and at Cullinan, to 1.15 million carats from 1.3 million carats. The Koffiefontein Mine was sold to Petra Diamonds Ltd. in November 2006. The Finsch Mine produced 2.22 million carats; the Kimberley Mine, 1.94 million carats; the Namaqualand Mine, 978,415 carats; and The Oaks Mine, 102,805 carats (De Beers Group, 2007, p. 10).

In October 2006, De Beers was awarded a mining license for the Voorspoed Mine in Free State Province. The company planned to complete the new mine at a cost of \$170 million by 2009; production was expected to be 1 million carats per year. In mid-2007, De Beers also planned to commence an upgrade at the Finsch Mine that could increase output by 500,000 carats per year. De Beers expected to start offshore diamond mining at the Atlantic coast at the rate of 280,000 carats per year in mid-2007 (De Beers Group, 2007, p. 10, 13).

Petra Diamonds Ltd. produced diamond from the Helam Mine in North West Province, the Sedibeng Mine in Northern Cape Province, and the Star Mine in Free State Province. The company produced 175,000 carats in fiscal year 2005-06 compared with 144,000 carats in fiscal year 2004-05. Petra planned to produce 500,000 carats from the Helam, the Koffiefontein, the Sedibeng, and the Star Mines in fiscal year 2009-10 (Petra Diamonds Ltd., 2007, p. 7-8, 10).

Fluorspar.—Van den Heever Fluorspar Works, Vergenoeg Mining Corp. (Pty) Ltd., and Witkop Fluorspar Mine (Pty) Ltd. (a subsidiary of Sallies Ltd.) produced fluorspar. Sallies purchased the Buffalo Mine, which shut down in 2000, from Transvaal Mining and Finance Company Ltd. In November 2006, Sallies was producing at a rate of about 145,000 t/yr at Witkop; the company planned to produce 48,000 t/yr at Buffalo (Creamer, 2006; Industrial Minerals, 2006).

Vermiculite.—In 2006, production at the Palabora Mine declined to 197,765 t from 209,801 t in 2005. Reserves at Palabora amounted to 38.9 Mt at a grade of 34% vermiculite. About 84% of South Africa's vermiculite output was exported in 2006 (Palabora Mining Company Ltd., 2007, p. 79; Martin Kohler, Deputy Director of Statistics, Department of Minerals and Energy of the Republic of South Africa, written commun., August 13, 2007).

Mineral Fuels and Related Materials

Coal.—Anglo American increased its production of coal to 59.3 Mt in 2006 from 56.9 Mt in 2005. Production at Isibonelo increased to 4.02 Mt from 1.36 Mt; at Goedehoop, to 8.5 Mt from 6.3 Mt; and at New Denmark, to 5.51 Mt from 4.14 Mt. Higher output from these mines more than offset lower output at the Bank and the New Vaal Mines. Production at the Bank Mine declined to 477,600 t from 3.2 Mt, and at New Vaal, to 16.3 Mt from 17.1 Mt. Anglo American supplied about 35 Mt/yr of thermal coal to South African utility Eskom; the output of the Isibonelo Mine was sold to Sasol Ltd. of South Africa for use in its coal-to-liquids plants (Anglo American plc, 2007, p. 18, 150).

The Mafube Mine produced 719,400 t of coal in 2006. Anglo American and Exxaro had a joint-venture agreement to increase capacity at Mafube to 5 Mt/yr by 2008. The capital cost of the project was estimated to be \$264 million. Coal from Mafube would be sold to Eskom and export markets. Other projects under consideration by Anglo American included the Zondagsfontein implementation, which could produce 6.6 Mt/yr starting in 2009; MACWest, 2.7 Mt/yr starting in 2009; Elders Opencast, 6.5 Mt/yr starting in 2011; and Elders Underground, 4 Mt/yr starting in 2013. These projects remained unapproved by the Board of Directors at the end of 2006 (Anglo American plc, 2007, p. 29, 150).

Ingwe Coal Corp. Ltd. (a subsidiary of BHP Billiton Group) produced coal at the Douglas, the Khutala, the Klipspruit, the Koornfontein, the Middleburg, and the Rietspruit Mines in Mpumalanga Province. In 2006, Ingwe produced 50.6 Mt of coal compared with 53.8 Mt in 2005. The company had a joint-venture agreement with Xstrata for the operation of the Douglas and the Middleburg Mines, where production declined to 21.4 Mt in 2006 from 23 Mt in 2005. Sales to local utilities amounted to 29.7 Mt in 2006; exports, 20.3 Mt; and sales to other South African customers, 938,000 t (BHP Billiton Group, 2006, 2007; Xstrata plc, 2007, p. 103).

In fiscal year 2005-06, Sasol Ltd. of South Africa decreased its coal production to 46.2 Mt from 47.7 Mt in fiscal year 2004-05. At the Secunda Mining Complex, which included the Bosjesspruit, the Brandspruit, the Middelbult, the Syferfontein, and the Twistdraai Mines, output declined to 44.6 Mt from 45.1 Mt. Lower production from Twistdraai more than offset higher production from other mines. The decline in output was attributable to the Sasolburg petrochemical plant switching from coal to natural gas as raw material. Sasol consumed 42 Mt of coal in the production of synthetic fuels and other chemicals and exported 3.6 Mt of coal in fiscal year 2005-06 (Sasol Ltd., 2006, p. 39-40, 43).

Exxaro operated the Grootegeluk and the Tshikondeni Mines in Limpopo Province and the Leeuwpan Mine in Mpumalanga Province. In November 2006, Exxaro acquired the Arnot, the Matla, and the New Clydesdale Mines and the North Block Complex from Eyesizwe Coal (Pty) Ltd. Production from the company's mines amounted to about 37.1 Mt in 2006. Sales to Eskom amounted to 34.7 Mt (Exxaro Resources Ltd., 2007, p. 4).

In August 2006, a new beneficiation plant with a capacity of 730,000 t/yr was started at Grootegeluk; the plant was expected to reach full capacity in mid-2007. Construction started in late 2006 on the Inyanda Mine near Witbank, which was expected to reach full production of 1 Mt/yr of thermal coal starting in 2008 (Exxaro Resources Ltd., 2007, p. 4, 28; undated).

In June 2006, Exxaro also completed a feasibility study on expanding capacity at the Grootegeluk Mine by an additional 7.3 Mt/yr. At yearend, Eskom and Exxaro were negotiating commercial agreements. Depending upon the success of the negotiations, development of the project could commence in 2008 with production starting in 2010 (Exxaro Resources Ltd., 2007, p. 30; undated).

Xstrata operated 11 coal mines at Breyten, Ermelo, and Witbank. In 2006, production at the company's mines increased to 18.9 Mt from 16.6 Mt in 2005. Production at the Boschmans

Mine increased to 2.84 Mt from 2.15 Mt; at the Waterpan Mine, to 2.19 Mt from 504,000 t; and at South Witbank, to 2.13 Mt from 1.86 Mt. The Goedgevonden Mine produced 1.05 Mt in 2006 compared with 956,000 t in 2005 (Xstrata plc, 2007, p. 102-103).

ARM and Xstrata were engaged in a joint venture to increase output at the Goedgevonden Mine to 6.7 Mt/yr. About 3.6 Mt/yr of coal was expected to be consumed domestically and about 3.1 Mt/yr to be exported. The increases in coal exports were subject to rail and mine capacity constraints; exports were not likely to reach the planned level until after 2009. The life of the mine was expected to be 32 years. Capital costs were estimated to be \$392 million (African Rainbow Minerals Ltd., 2006, p. 43; Xstrata plc, 2007, p. 67).

Uranium.—AngloGold Ashanti mined uranium as a coproduct of gold at the Great Noligwa and the Tau Lekoa Mines. In 2006, the company's production of uranium oxide (U_3O_8) declined to 639 t from 795 t in 2005. AngloGold Ashanti planned to increase its uranium production by about 40% starting in late 2008 by treating ore from the Kopanang gold mine and upgrading its new uranium processing plant (Mining Review Africa, 2006b).

Uranium One Inc. of Canada planned to start production at the Dominion underground uranium mine in the first quarter of 2007. The company planned to produce an average of 1,700 t/yr of U_3O_8 between 2011 and 2014; production was expected to be nearly 2,000 t of U_3O_8 in 2012. Total production in the first phase of the project was expected to be 12,300 t of U_3O_8 and 15,600 kg of gold; capital costs were estimated to be \$244 million. Reserves were estimated to be 18.5 Mt that contained 14,200 t of U_3O_8 (Uranium One Inc., 2006).

First Uranium planned to produce an average of 450 t/yr of U_3O_8 at the Buffelsfontein tailings project between 2010 and 2021; production was expected to start in 2008. The company also planned to produce an average of 450 t/yr of U_3O_8 at the Ezulwini Mine between 2009 and 2024; uranium production was expected to start in June 2008 (First Uranium Corp., 2007).

Outlook

Capacity expansions by numerous producers are likely to lead to higher production of coal, ferrochromium, ferromanganese, fluorspar, ilmenite, iron ore, manganese ore, nickel, PGM, rutile, steel, uranium, vanadium, and zircon for the next 5 years. These expansions depend upon the continuation of the broad-based increase in world demand for minerals. Factors that could inhibit these plans included the strength of the South African rand and the high rates of HIV infection in the mining workforce.

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TABLE 1
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	2002	2003	2004	2005	2006 ^p
METALS					
Aluminum metal, primary	706,916	735,000 ^r	866,074 ^r	846,213 ^r	895,000
Antimony concentrate:					
Gross weight	9,910	9,000	8,400 ^c	10,000 ^{r,c}	10,000 ^c
Sb content (58% Sb)	5,746	5,291	4,967	5,979 ^r	6,000 ^c
Chromium, gross weight:					
44% to 48% chromic oxide thousand metric tons	2,459	2,640	2,888	2,394	1,755
Less than 44% chromic oxide do.	3,977	4,766	4,789	5,100	5,663
Total do.	6,436	7,406	7,677	7,494	7,418
Cobalt:					
Mine output, Co content ^c	520	400	460	400	400
Refinery output:	366	271	309	268	267
Copper:					
Mine (company output), Cu content	129,589	120,800	102,574	96,600 ^r	100,000 ^c
Metal:					
Smelter	119,667	112,025	89,300	110,000 ^e	110,000 ^c
Refined, primary	130,000 ^r	121,000	91,495 ^r	99,388 ^r	104,137
Gold, primary kilograms	398,523	373,300	337,223	294,671	272,128
Iron and steel:					
Ore and concentrate:					
Gross weight thousand metric tons	36,484	38,085 ^r	39,322	39,542	41,326
Fe content (62%-65%) do.	23,200	24,200	24,800	24,900	26,000
Metal:					
Pig iron do.	5,823	6,234	6,011	6,130	6,160
Direct-reduced iron do.	1,702	1,542	1,633	1,781	1,754
Ferrous alloys, electric arc furnace:					
Chromium ferrous alloys do.	2,351	2,813	2,965 ^r	2,812	3,030
Ferromanganese do.	619	607	612	571 ^r	670 ^c
Ferrosilicon do.	142	135	141	127 ^r	140 ^c
Ferrovanadium ^c do.	19 ^r	19 ^r	20 ^r	19 ^r	18
Silicomanganese ^c do.	273	301	310	270	320
Silicon metal do.	43	49	51	54	60 ^c
Other do.	85	80	80 ^c	80 ^c	80
Total ^e do.	3,530 ^r	4,000 ^r	4,180 ^r	3,930 ^r	4,320
Steel:					
Crude do.	9,095 ^r	9,481	9,500	9,493	9,721
Stainless do.	550	643	718	658	747
Lead:					
Concentrate, Pb content	49,444	39,941	37,485	42,159	48,273
Refined, secondary	60,900	64,900	64,100	65,300 ^r	70,000 ^c
Manganese:					
Ore and concentrate, gross weight:					
Metallurgical:					
More than 48% manganese thousand metric tons	1,600	1,619	1,988	2,467	1,452
45% to 48% manganese do.	728	178	372	454	1,812
40% to 45% manganese do.	19	783	1,041	935	895
30% to 40% manganese do.	955	905	864	743	1,042
Total do.	3,302	3,485	4,265	4,599	5,201
Chemical, 35% to 65% manganese dioxide do.	20	16	17	12	12
Grand total do.	3,322	3,501	4,282 ^r	4,611	5,213
Metal, electrolytic ^c do.	40	40	40	44 ²	44
Nickel:					
Mine output, concentrate, nickel content	38,546	40,842	39,851	42,392	41,599
Metal, electrolytic	31,646	40,800	39,900	42,400 ^c	41,600 ^c

See footnotes at end of table.

TABLE 1--Continued
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity		2002	2003	2004	2005	2006 ^p
METALS--Continued						
Platinum-group metals:						
Iridium	kilograms	3,682	6,444	5,769	6,280	6,172
Platinum	do.	132,897	148,348	153,239	163,711	168,125
Palladium	do.	63,758	70,946	76,403	82,961	86,265
Rhodium	do.	15,175	16,816	16,294	20,224	19,633
Ruthenium	do.	21,022	23,537	24,696	29,805	27,333
Other ³	do.	107	59	--	--	--
Total	do.	236,641	266,150	276,401	302,981	307,528
Silver	do.	113,142	79,817	71,600 ^r	87,874	86,951
Titanium: ^e						
Ilmenite concentrate	thousand metric tons	1,800	2,000	1,900	1,900	1,900
Rutile concentrate	do.	138 ^r	108 ^r	110 ^r	115 ^r	123
Total	do.	1,940 ^r	2,110 ^r	2,010 ^r	2,020 ^r	2,020
Titaniferous slag ⁴	do.	973 ^r	1,010 ^r	1,020 ^r	1,020 ^r	1,230
Uranium oxide		998	894	887	795	639
Vanadium, vanadium metal content		25,227	27,172	23,302	22,604	23,780
Zinc:						
Concentrate:						
Gross weight		118,900	103,100	80,000 ^e	80,000 ^e	85,000 ^e
Zn content		64,580	41,400	32,001	32,112	34,444
Metal, smelter, primary		111,000	111,000 ^r	104,000	102,000	90,000
Zirconium concentrate (baddeleyite and zircon) ^c		429,000 ^r	404,000 ^r	368,000 ^r	376,000 ^r	398,000
INDUSTRIAL MINERALS						
Andalusite		165,087	164,921	234,625	228,375 ^r	230,000 ^e
Asbestos, chrysotile		--	6,218	--	--	--
Cementitious products:						
Cement, finished product, sales	thousand metric tons	8,525	8,883	12,348	13,000 ^e	13,000 ^e
Granulated slag, fly ash, and others, sales	do.	1,099	1,280	1,436	1,500 ^e	1,500 ^e
Total	do.	9,624	10,163	13,784	14,500 ^e	14,500 ^e
Clays:						
Attapulgit		13,288	14,585	20,419	34,340	49,225
Bentonite		101,100	145,060	55,859	139,833	32,878
Fire clay		101,150	90,604	133,258	171,773	157,087
Flint clay, raw and calcined		41,963	53,279	53,367	36,607	34,413
Kaolin		86,700	86,365	81,901	59,356	51,602
Brick clay, local sales	thousand metric tons	6,203	7,593	9,523 ^r	11,237 ^r	11,131
Diamond, natural:						
Gem	thousand carats	4,350	5,144	5,800 ^e	6,400 ^e	6,100 ^e
Industrial	do.	6,526	7,540	8,500 ^e	9,400 ^e	9,100 ^e
Total	do.	10,876	12,684	14,295	15,776	15,153
Feldspar		66,600 ^r	57,738	53,721	57,534	76,722
Fluorspar:						
Acid-grade		216,000 ^e	221,000	250,000 ^e	250,000 ^e	250,000 ^e
Metallurgical-grade		11,000 ^e	14,000	15,000 ^e	16,000 ^{r,e}	20,000 ^e
Total		227,000	235,000	265,000	266,000 ^r	270,000
Gemstones, semiprecious, Tiger's eye ^c	kilograms	-- ²	-- ²	--	--	--
Gypsum, crude		421,861	394,069	524,000 ^r	547,581	554,020
Industrial or glass sand (silica)	thousand metric tons	2,251 ^r	2,311 ^r	2,249 ^r	2,671	3,234
Lime	do.	1,585	1,571 ^r	1,738	1,417	1,583
Magnesite, crude		87,200	86,100	65,900	54,800 ^r	55,000 ^e
Mica, scrap and ground		880	1,003	285 ^r	924	828
Nitrogen, N content of ammonia		491,900	493,200	459,100	460,000 ^e	460,000 ^e
Perlite ^e		400	400	400	400	400

See footnotes at end of table.

TABLE 1--Continued
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	2002	2003	2004	2005	2006 ^p	
INDUSTRIAL MINERALS--Continued						
Phosphate rock:						
Gross weight	thousand metric tons	2,803	2,643	2,735	2,577	2,629
Phosphorus pentoxide content	do.	1,086	1,030	1,070	1,000 ^e	1,020 ^e
Pigments, mineral, natural:						
Ochers		143	608	360	382	372
Oxides		109	156	152	128	218
Total		252	764	512	510	590
Salt		429,429	441,306	332,673	399,087	464,909
Sodium sulfate, natural		53,793	52,813	56,267	55,184	43,303
Stone, n.e.s.:						
Dimension:						
Granite and norite ⁵		705,800	463,200 ^r	548,600 ^r	607,500 ^r	285,790
Slate		24,800 ^r	40,700	47,500	52,312	33,154
Crushed and broken:						
Limestone and dolomite	thousand metric tons	20,738	21,267	22,031 ^r	24,813 ^r	25,000 ^e
Quartzite	do.	318	--	--	--	--
Shale:						
For cement	do.	275	345	357	501	533
Other ⁵	do.	67	49	50 ^e	50 ^e	50 ^e
Total	do.	342	394	407 ^e	551 ^e	583 ^e
Aggregate and sand, n.e.s.	do.	28,916	32,587	44,437	49,970	58,519
Sulfur:						
S content of pyrite (53.45%)	do.	183	176	165	133	68
Byproduct:						
Metallurgy	do.	179	174	180	220 ^r	200 ^e
Petroleum	do.	170	264	288	422 ^r	375 ^e
Total	do.	532	614	633	776	643
Talc and related materials:						
Talc		2,511	6,719	8,141	8,469	10,966
Pyrophyllite (wonderstone)		15,587	14,350	28,987	60,267	74,886
Vermiculite		210,000	182,802	196,893	209,801	197,765
MINERAL FUELS AND RELATED MATERIALS						
Coal (salable product):						
Anthracite	thousand metric tons	1,305	1,206	1,247 ^r	1,640 ^r	1,584
Bituminous	do.	218,895	238,105	241,500 ^r	243,300 ^r	243,198
Total	do.	220,200	239,311	242,747 ^r	244,940 ^r	244,782
Natural gas	million cubic meters	2,000 ^e	1,247 ^r	1,916 ^r	2,060 ^r	1,795
Petroleum: ⁶						
Crude	thousand 42-gallon barrels	10,950	4,068	6,769	7,277	4,441
Refinery products:						
Liquefied petroleum gases	do.	3,677	3,561	3,538	3,500 ^e	3,500 ^e
Gasoline	do.	73,077	77,452	71,166	71,000 ^e	71,000 ^e
Jet fuel	do.	16,726	17,350	14,331	14,000 ^e	14,000 ^e
Kerosene	do.	4,754	4,831	4,893	4,900 ^e	4,900 ^e
Distillate fuel oil	do.	59,620	63,268	53,272	53,000 ^e	53,000 ^e
Residual fuel oil	do.	34,452	47,959	27,919	28,000 ^e	28,000 ^e
Other, includes lubricants and greases ^c	do.	21,000	21,000	17,000	17,000 ^e	17,000 ^e
Total ^{c,7}	do.	213,000	235,000	192,000	191,000	191,000

^eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^pPreliminary. ^rRevised. -- Zero.

¹Table includes data available through November 30, 2007.

²Reported figure.

³Difference between total production reported by the South African Department of Minerals and Energy, Mineral Development Branch, Mineral Economics Directorate and palladium, platinum, and rhodium supplies (shipments) reported in Johnson and Matthey Annual Platinum Review. Includes iridium and ruthenium production plus excess palladium, platinum, and rhodium inventory.

TABLE 1--Continued
SOUTH AFRICA: PRODUCTION OF MINERAL COMMODITIES¹

⁴Except for about 45,000 metric tons per year, slag derived from titaniferous magnetite by Highveld Steel and Vanadium Corp. Ltd.; titaniferous slag is all from the smelting of ilmenite and likely represents most of that mineral's production, for which data are unavailable.

⁵Converted from reported cubic meters by using 1 cubic meter = 2.7 metric tons.

⁶In addition, Sasol Ltd. produced about 67 million barrels per year of synthetic liquid petroleum fuels from coal.

⁷Excludes refinery fuel and losses.

Source: Mineral Economics Directorate, South Africa Department of Minerals and Energy.

TABLE 2
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2006¹

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	BHP Billiton Aluminium South Africa (Pty) Ltd. (BHP Billiton Plc, 100%)	Hillside smelter at Richards Bay	700.
Do.	do.	Bayside smelter at Richards Bay	180.
Andalusite	Rhino Minerals (Pty) Ltd. (Imerys, 100%)	Rhino Mine near Thabazimbi	120.
Do.	do.	Havercroft Mine at Penge	60.
Do.	Samrec Pty. Ltd. of France (Imerys, 100%)	Annesley Mine at Penge	75.
Do.	do.	Krugerspost Mine, near Lydenburg	50.
Do.	do.	Andalusite Refractories Mine at Groot Marico	15.
Do.	Hoogenoeg Andalusite (Pty) Ltd.	Hoogenoeg Mine and plant	36.
Do.	Andalusite Resources (Pty) Ltd. (African Mineral Trading and Exploration (Pty) Ltd.)	Maroeloesfontein, near Thabazimbi, Northern Province	30.
Antimony	Consolidated Murchison Ltd. (Metorex Pty. Ltd., 100%)	Consolidated Murchison Mine near Gravelotte	7,000 antimony concentrate.
Cement	Pretoria Portland Cement Co. (Pty) Ltd. (Barlworld Trust Co. Ltd., 68%)	De Hoek, Dwaalboom, Hercules, Port Elizabeth, Riebeeck, and Slurry plants	6,800.
Do.	Alpha Ltd. [Holcim Ltd. (Switzerland)]	Dudfield and Ulco plants	3,700.
Do.	Lafarge South Africa Ltd. [Lafarge (France)]	Lichtenburg plant in North West Province	2,700.
Do.	Natal Portland Cement Co. (Pty) Ltd. (Cimentos de Portugal SGPS, S.A., 98%)	Simumu plant	1,055.
Chromite	Xstrata plc, 79.5%; Merafe Resources Ltd., 20.5%	Kroondal Mines at Rustenburg	2,460.
Do.	do.	Thorncliffe Mine at Steelpoort	1,440.
Do.	do.	Helena Mine at Steelpoort	600.
Do.	do.	Waterval Mine at Rustenburg	480.
Do.	do.	Boshhoek Mine at Boshhoek	360.
Do.	do.	Horizon Mine at Pilansberg	180.
Do.	Samancor Chrome Ltd. (Kermas Group Ltd., 100%)	Eastern Chrome Mines in Steelpoort Valley, Mpumalanga Province	2,000.
Do.	do.	Western Chrome Mines in Northern Province	1,800.
Do.	Assmang Ltd. (African Rainbow Minerals Ltd., 50%, and Assore Ltd., 50%)	Dwarsrivier Mine	880. ^c
Do.	Bayer (Pty) Ltd.	Rustenburg Chrome Mine	450.
Do.	Dilokong Chrome Mine (Pty) Ltd. (ASA Metals (Pty) Ltd., 100%)	Dilokong Mine, near Lydenburg	320. ^c
Do.	Merafe Resources Ltd.	Horizon Mine	250.
Do.	National Manganese Mines (Pty) Ltd.	Buffelsfontein Mine at Mooinooi	180.
Coal	Anglo Coal Ltd. (Anglo American plc, 100%)	Bank, Goedehoop, Isibonelo, Kleinkopje, Kriel, Landau, Mafube, New Denmark, New Vaal and Nootgedacht Mines	60,000. ^c
Do.	Ingwe Coal Corp. Ltd. (BHP Billiton Plc, 100%)	Witbank Coalfield, Mpumalanga Province:	
Do.	do.	Middelburg Mine (Xstrata plc, 16% interest)	17,000 bituminous.
Do.	do.	Khutala Underground Mine	15,100 bituminous.
Do.	do.	Optimum Open Pit Mine	13,500 bituminous.
Do.	do.	Douglas Mine (Xstrata plc, 16% interest)	8,500 bituminous.
Do.	do.	Koornfontein Mines	5,200 bituminous.
Do.	do.	Klipspruit Mine	3,600 bituminous.
Do.	Zululand Anthracite Colliery (BHP Billiton Plc, 100%)	Zululand Mine, KwaZulu Natal Province	600 anthracite. ^c
Do.	Sasol Ltd.	Secunda Mines:	
Do.	do.	Twistdraai Mine	10,600.
Do.	do.	Syferfontein Mine	8,700.
Do.	do.	Brandspruit Mine	8,400.
Do.	do.	Middlebult Mine	8,200.
Do.	do.	Bosjesspruit Mine	8,100.
Do.	do.	Moholo and Mooikraal Mines	1,700.

See footnotes at end of table.

TABLE 2--Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2006¹

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners		Location of main facilities	Annual capacity
Coal--Continued	Exxaro Resources Ltd. (Anglo American plc, 67%)		Grootegeluk Mine in Limpopo Province	18,600.
Do.	Exxaro Resources Ltd.		Matla Mine in Mpumalanga Province	14,000.
Do.	do.		Arnot Mine in Mpumalanga Province	5,000.
Do.	do.		North Block Mine in Mpumalanga Province	3,000.
Do.	do.		Leeuwpan Mine in Mpumalanga Province	2,500.
Do.	do.		New Clydesdale Mine in Mpumalanga Province	1,400.
Do.	do.		Tshikondeni Mine in Limpopo Province	414.
Do.	Xstrata plc, 74%		Twefontein Division (Boschmans, Goedgevonden, South Witbank, Waterpan, and Witcons Mines) at Witbank	8,200.
Do.	do.		ATC and ATCOM Mines at Witbank	4,100.
Do.	do.		Mpumalanga Division (Spitzkop and Tselentis Mines) at Breyton and Ermelo	3,300.
Do.	do.		iMpunzi Division (Phoenix and Tavistock Mines) at Witbank	3,200.
Do.	Anker Holdings B.V.		Elandsfontein Mine	2,040.
Do.	do.		Golfview Mine	1,740.
Do.	Kangra Group Pty. Ltd.		Savmore and Welgedacht collieries	3,000. ^c
Do.	Wakefield Investments (Pty) Ltd. (subsidiary of Shanduka Group)		Bankfontein, Lakeside, Leeuwfontein, and Middleburg Townlands Mines	2,300. ^c
Do.	Total Coal SA (Pty) Ltd.		Dorsfontein and Forzando Mines	2,000. ^c
Do.	Graspan Colliery Pty Ltd.		Graspan Mine	1,800.
Do.	Kuyasa Mining (Pty) Ltd.		Delmas Mine	1,200. ^c
Copper	Palabora Mining Co. Ltd. (Rio Tinto Ltd., 57%, and Anglo American plc, 29%)		Palabora Mines at Phalaborwa	80 copper in concentrate. ²
Do.	do.		Smelter at Phalaborwa	135 anodes. ²
Do.	do.		Refinery at Phalaborwa	135 cathodes.
	Anglo American Platinum Corp. Ltd. (Anglo American plc, 74.1%)		Amandebult, Rustenburg, and Union sections; and Bafokeng Rasimone, Lebowa, Modikwa, Potgietersrust, and Western Limb Mines	13 mine. ^c
Do.	do.		Rustenburg Base Metal Refiners	12 refined. ^c
Do.	Black Mountain Mineral Development Co. (Pty) Ltd. (Anglo American plc, 100%)		Black Mountain Mine near Aggeneys	6 copper in concentrate.
Do.	Lonmin Platinum (Lonmin plc., 73%, and Impala Platinum Holdings Ltd., 27%)		Marikana Mines (Eastern Platinum, Karee, and Western Platinum) near Rustenburg and Limpopo Mine	3 mine. ^c
Do.	do.		Base Metals Refinery	3 refined. ^c
Do.	Impala Platinum Ltd. (Impala Platinum Holdings Ltd., 100%)		do.	NA.
Diamond	thousand carats	De Beers Consolidated Mines Ltd. (Anglo American plc, 29%)	Venetia Mine in Northern Province	8,100.
Do.	do.	do.	Finsch Mine, 100 kilometers west of Kimberley	2,400.
Do.	do.	do.	Kimberley Mines, Kimberley	1,800.
Do.	do.	do.	Cullinan Mine	1,100.
Do.	do.	do.	Namaqualand Mine, 50 kilometers north of Port Nolloth	920.
Do.	do.	do.	The Oaks	120.
Do.	do.	Petra Diamonds Ltd.	Helam, Sedibeng, and Star Mines	175.
Do.	do.	do.	Koffiefontein Mine, 70 kilometers south of Kimberley	140.
Do.	do.	Trans Hex Group Ltd.	Baken, Bloeddrif, Reuning, and Saxendrift Mines	140. ^c

See footnotes at end of table.

TABLE 2--Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2006¹

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners		Location of main facilities	Annual capacity
Fluorspar	Witkop Fluorspar Mine (Pty) Ltd. (subsidiary of Sallies Ltd.)		Witkop Mine, 250 kilometers west of Johannesburg	180.
Do.	Vergenoeg Mining Corp. (Pty) Ltd. [Metorex Pty. Ltd., 70%, and Minerale y Productos Derivados SA (Spain), 30%]		Vergenoeg Mine, 75 kilometers north of Pretoria	120.
Do.	Van den Heever Fluorspar Works		Van Den Heever Mine, 120 kilometers west of Johannesburg	50 metallurgical-grade fluorspar. ^c
Gold:				
Mine	AngloGold Ashanti Ltd. (Anglo American plc, 41.8%)		Vaal River operations: Kopangang Mine	5,000 ore.
Do.	kilograms	do.	do.	35,000 gold.
Do.		do.	Great Nologwa Mine	2,700 ore.
Do.	kilograms	do.	do.	22,000 gold.
Do.		do.	Tau Lekoa Mine	5,000 ore.
Do.	kilograms	do.	do.	19,000 gold.
Do.		do.	Vaal River surface operations	5,800 ore.
Do.	kilograms	do.	do.	3,000 gold.
Do.	do.	do.	Moab Khotsong Mine	1,400 gold.
Do.		do.	West Wits operations: Tau Tona Mine	3,100 ore.
Do.	kilograms	do.	do.	32,000 gold.
Do.		do.	Savuka Mine	3,000 ore.
Do.	kilograms	do.	do.	23,000 gold.
Do.		do.	Mponeng Mine	1,900 ore.
Do.	kilograms	do.	do.	19,000 gold.
Do.		Gold Fields Ltd.	Kloof Mine	3,840 ore.
Do.	kilograms	do.	do.	31,000 gold.
Do.		do.	Driefontein Mine	7,140 ore.
Do.	kilograms	do.	do.	59,000 gold.
Do.		do.	Beatrix Mine	4,920 ore.
Do.	kilograms	do.	do.	27,000 gold.
Do.		Western Areas Ltd. (JCI Gold, 50%, and Gold Fields Ltd., 50%)	South Deep Mine	2,700 ore.
Do.	kilograms	do.	do.	16,000 gold.
Do.		Harmony Gold Mining Co. Ltd.	Randfontein Mine	6,000 ore.
Do.	kilograms	do.	do.	31,000 gold.
Do.		do.	Free State operations	5,280 ore.
Do.	kilograms	do.	do.	24,000 gold.
Do.		Freegold Joint Venture (Harmony Gold Mining Co. Ltd., 50%, and African Rainbow Minerals Ltd., 50%)	Freegold operations	5,040 ore.
Do.	kilograms	do.	do.	15,000 gold.
Do.		Harmony Gold Mining Co. Ltd.	Elandsdraal Mines	1,680 ore.
Do.	kilograms	do.	do.	12,000 gold.
Do.		do.	Evander operations	1,776 ore.
Do.	kilograms	do.	do.	11,000 gold.
Do.		do.	Target Mine	1,260 ore.
Do.	kilograms	do.	do.	8,000 gold.
Do.		do.	Kalgold Mine	1,560 ore.
Do.	kilograms	do.	do.	1,700 gold.
Do.		do.	Orkney and Welkom Mines	NA.

See footnotes at end of table.

TABLE 2--Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2006¹

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners		Location of main facilities	Annual capacity
Gold--Continued:				
Mine--Continued	Durban Roodeport Deep Ltd.		Blyvooruitzicht and Doornfontein section	4,800 ore.
Do.	kilograms	do.	do.	6,900 gold.
Do.		do.	Crown section--tailings retreatment	11,760 ore.
Do.	kilograms	do.	do.	4,700 gold.
Do.		do.	East Rand Proprietary Mine	1,800 ore.
Do.	kilograms	do.	do.	2,500 gold.
Do.		Thistle Mining, Inc.	President Steyn Gold Mines in Free State	1,200 ore.
Do.	kilograms	do.	do.	7,800 gold.
Do.	do.	Barberton Mines Ltd. [Metorex Ltd., 54%, and Shanduka Resources (Pty) Ltd., 26%]	Eastern Transvaal Consolidated Division (Fairview, New Consort, and Sheba Mines)	3,200. ^c
Refined	metric tons	Rand Refinery Ltd.	Germiston, Gauteng Province	1,200.
Do.	do.	Harmony Gold Mining Co. Ltd.	Musuku Beneficiation Systems	100.
Iron and steel:				
Iron ore		Kumba Iron Ore Ltd.	Sishen Mine at Sishen	28,000.
Do.		do.	Thabazimbi Mine at Thabazimbi	2,400.
Do.		Assmang Ltd.	Beeshoek Mine near Postmasburg	6,000.
Do.		Highveld Steel and Vanadium Corp. Ltd. (Anglo American plc, 79%)	Mapochs Mine at Roosenekal, 60 kilometers west of Lydenburg	2,450.
Do.		Xstrata plc	Rhovon Mine at Brits	400.
Do.		Vametco Minerals Corp. (Strategic Minerals Corp., 100%)	Krokodilkraal Mine and plant near Brits	180.
Ferroalloys		Xstrata plc, 79.5%, and Merafe Resources Ltd., 20.5%	Wonderkop	553 ferrochromium.
Do.		do.	Rustenburg	430 ferrochromium.
Do.		Xstrata plc, 69.6%	Lydenburg	396 ferrochromium.
Do.		Xstrata plc, 79.5%, and Merafe Resources Ltd., 20.5%	Lion plant at Steelpoort	360 ferrochromium.
Do.		do.	Boshhoek	240 ferrochromium.
Do.		Samancor Chrome Division (Kermas Group Ltd., 100%)	Ferrometals plant at Witbank	415 ferrochromium.
Do.		do.	Tubatse Ferrochrome plant at Steelpoort	340 ferrochromium.
Do.		do.	Middelburg Ferrochrome plant, 35 kilometers east of Witbank	235 ferrochromium.
Do.		Hernic Ferrochrome (Pty) Ltd. (Mitsubishi Corp., 51%)	Plant at Brits	420 ferrochromium.
Do.		Assmang Ltd.	Machadadorp plant in Mpumalanga Province	290 ferrochromium.
Do.		Merafe Resources Ltd. (Royal Bafokeng Nation, 33.2%, and Industrial Development Corporation of South Africa Ltd., 25.2%)	Smelter at Boshhoek, North West Province	235 ferrochromium.
Do.		ASA Metals (Pty) Ltd. (Eastern Asia Metal Investment Co. Ltd., 60%, and Northern Province Development Corp., 40%)	Plant near Pietersburg, Northern Province	120 ferrochromium.
Do.		Samancor Manganese Division (BHP Billiton Plc, 54.6%; Anglo American plc, 28.9%; other private, 16.5%)	Metalloys Ltd. plant at Meyerton; can switch between ferromanganese and silicomanganese	560 high-carbon ferromanganese; 200 silicomanganese.
Do.		Assmang Ltd.	Cato Ridge plant in KwaZulu Natal Province	300 ferromanganese.
Do.		Samancor Manganese Division, 100%	Furnace at Samancor's Meyerton plant	75 ferromanganese.
Do.		Transalloys Division (Highveld Steel and Vanadium Corp. Ltd., 100%)	Plant at Witbank	45 medium-carbon ferromanganese.
Do.		do.	do.	170 silicomanganese.
Do.		Silicon Technology Pty Ltd.	NA	55 ferrosilicon.

See footnotes at end of table.

TABLE 2--Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2006¹

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners		Location of main facilities	Annual capacity
Iron and steel--Continued:				
Ferroalloys--Continued	Highveld Steel and Vanadium Corp.		Rand Carbide plant	55 ferrosilicon.
Do.	metric tons	do.	Plant at Witbank	12,500 ferrovanadium.
Do.	do.	Xstrata plc	Rhovon plant at Brits	7,800 ferrovanadium.
Do.	do.	Vametco Minerals Corp. (Strategic Minerals Corp., 100%)	Smelter near Brits	5,250 ferrovanadium.
Steel	Mittal Steel South Africa Ltd.		Newcastle, Saldanha, Vanderbijlpark, and Vereeniging plants	7,100 crude steel.
Do.	Highveld Steel and Vanadium Corp. Ltd. (Anglo American plc, 79%)		Witbank	1,000 iron; 1,000 crude steel.
Do.	Columbus Stainless (Pty) Ltd. (Acerinox SA, 76%)		Stainless steel plant at Middelburg	750 crude steel.
Do.	Scaw Metals Division (Anglo Operations Ltd.)		Germiston plant, Johannesburg	600 crude steel.
Do.	Davsteel Division (Cape Gate Pty. Ltd.)		Vanderbijlpark plant, Gauteng	480 crude steel; 480 billet.
Do.	Cape Town Iron & Steel Works (Pty) Ltd.		Kuilsrivier plant, Cape Town	250 crude steel; 250 billet.
Do.	Duferco Steel Processing Ltd.		Cold-rolled slab steel at Saldanha Bay	240 rolled steel.
Lead	Black Mountain Mineral Development Co. (Pty) Ltd.		Black Mountain Mine near Aggeneys	54 lead in concentrate.
Lime	PPC Lime Ltd (subsidiary of Pretoria Portland Cement Company Ltd.)		Plant at Lime Acres	1,200.
Do.	Idwala Lime (Idwala Industrial Holdings)		Plant at Daniëlskuil	1,000.
Do.	Inca Lime (Pty) Ltd. (subsidiary of Inca Mining (Pty) Ltd.)		Plant at Immerpan, Limpopo Province	100.
Manganese	Assmang Ltd.		Nchwaning Mine near Black Rock	3,000 ore.
Do.	do.		Gloria Mine near Black Rock	600 ore.
Do.	Samancor Manganese (Pty) Ltd. (BHP Billiton Plc, 60%, and Anglo American plc, 40%)		Mamatwan and Wessels Mines near Hotazel	3,400 ore.
Do.	Metmin (Metorex Pty. Ltd., 100%)		Open pit mine in North West Province	24 manganese dioxide.
Do.	Manganese Metal Co. Pty. Ltd. (BHP Billiton Plc, 51%)		Electrolytic plant at Nelspruit	30 manganese metal.
Do.	do.		Electrolytic plant at Krugersdorp	20 manganese metal.
Nickel	Anglo American Platinum Corp. Ltd.		Amandebult, Rustenburg, and Union sections; and Bafokeng Rasimone, Lebowa, Modikwa, Potgietersrust, and Western Limb Mines	24 mine. ^c
Do.	do.		Rustenburg Base Metal Refiners	22 refined. ^c
Do.	Impala Platinum Ltd.		Impala Mines	8 mine. ^c
Do.	do.		Impala Refining Services	10 refined. ^c
Do.	do.		Base Metals Refinery	14 refined. ^c
Do.	Lonmin plc		Marikana Mines (Eastern Platinum, Karee, and Western Platinum) near Rustenburg and Limpopo Mine	5 mine. ^c
Do.	do.		Base Metals Refinery	5 refined. ^c
Do.	Nkomati Joint Venture (African Rainbow Minerals Ltd., 50%, and LionOre Mining International Ltd., 50%)		Nkomati Mine in Mpumalanga Province	5 mine.
Petroleum:				
Crude	thousand 42-gallon barrels	Petroleum Oil and Gas Corporation of South Africa, 55%, and Pioneer Natural Resources Company, 45%	Pioneer offshore field	21,900.
Do.	do.	Petroleum Oil and Gas Corporation of South Africa	Oribi field, 140 kilometers southwest offshore from Mossel Bay	9,100.
Do.	do.	do.	Oryx field	4,400.

See footnotes at end of table.

TABLE 2--Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2006¹

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum--Continued:				
Refined	thousand 42-gallon barrels	Shell and BP Refineries Pty. Ltd. (Shell SA Energy, 50%, and BP Southern Africa, 50%)	Sapref refinery in Durban	63,900.
Do.	do.	Engen Ltd. (62%)	Engen refinery in Durban	54,800.
Do.	do.	Caltex Oil SA Pty. Ltd. (private, 100%)	Calref refinery in Cape Town	40,200.
Do.	do.	National Petroleum Refiners of South Africa Pty. Ltd. (Sasol Ltd., 63.6%)	Natref refinery in Sasolburg	32,000.
Phosphate rock		Phosphate Development Corp. Ltd. (Foskor Ltd.) (Industrial Development Corp., 100%)	Foskor Mine and plant at Phalaborwa	3,850 phosphate rock. ³
Do.		Fer-Min-Ore Ltd.	Plant at Germiston	30.
Do.		do.	Plant at Isithebe	12.
Platinum-group metals		Anglo American Platinum Corp. Ltd.	Rustenburg section near Rustenburg	12,420 ore.
Do.	kilograms	do.	do.	20,000 platinum; 8,800 palladium; 2,200 rhodium.
Do.		do.	Amandelbult section, 50 kilometers south of Thabazimbi mines	4,080 Merensky ore. 2,640 UG2 ore.
Do.	kilograms	do.	do.	19,000 platinum; 8,900 palladium; 2,200 rhodium.
Do.		do.	Union section, 50 kilometers south of Thabazimbi	6,000 ore.
Do.	kilograms	do.	do.	10,000 platinum; 4,600 palladium; 1,600 rhodium.
Do.		Bafokeng Rasimone Platinum Mine (Anglo American Platinum Corp. Ltd., 50%, and Royal Bafokeng Nation, 50%)	Bafokeng Rasimone Mine in Northern Province	2,400 ore.
Do.	kilograms	do.	do.	12,000 platinum; 5,200 palladium; 730 rhodium.
Do.	do.	Kroondal Platinum Mines (Anglo American Platinum Corp. Ltd., 50%, Aquarius Platinum Ltd, 25.5%)	Kroondal Mine	9,300 platinum; 4,600 palladium; 1,700 rhodium.
Do.		Modikwa Platinum Mine (Anglo American Platinum Corp. Ltd., 50%, and African Rainbow Minerals, 50%)	Modikwa Mine	2,400 ore.
Do.	kilograms	do.	do.	8,600 platinum; 8,400 palladium; 1,600 rhodium.
Do.		Anglo American Platinum Corp. Ltd.	Potgietersrust Platinum Mine	4,620 ore.
Do.	kilograms	do.	do.	5,800 platinum; 6,500 palladium; 390 rhodium.
Do.		do.	Lebowa Platinum (Atok) Mine, 70 kilometers east of Potgietersrus	960 Merensky ore. 600 UG2 ore.
Do.	kilograms	do.	do.	3,200 platinum; 2,200 palladium; 350 rhodium.
Do.		do.	Western Limb Mine	5,400 ore.
Do.	kilograms	do.	do.	1,500 platinum; 590 palladium; 100 rhodium.

See footnotes at end of table.

TABLE 2--Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2006¹

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners		Location of main facilities	Annual capacity
Platinum-group metals--Continued	Anglo American Platinum Corp. Ltd.		Polokwane smelter	650 concentrate.
Do.	do.		Mortimer smelter	600 concentrate.
Do.	do.		Waterval smelter	200 concentrate.
Do.	kilograms	do.	Mortimer, Polokwane, and Waterval smelters	110,000 platinum; 60,000 palladium; 15,000 rhodium.
Do.	do.	do.	Precious Metals Refinery	110,000 platinum metal; 60,000 palladium metal; 15,000 rhodium metal.
Do.	Impala Platinum Ltd. (Impala Platinum Holdings Ltd., 100%)		Impala Mines, near Rustenburg in North West Province	17,000 ore.
Do.	kilograms	do.	do.	36,000 platinum; 16,000 palladium; 4,100 rhodium.
Do.	Impala Platinum Ltd.		Marula Mine	2,200 ore.
Do.	kilograms	do.	do.	2,800 platinum; 2,800 palladium; 580 rhodium.
Do.	do.	do.	Smelter	62,000 platinum; 29,000 palladium; 7,200 rhodium.
Do.	do.	do.	Precious metals refinery, near Springs in Guateng Province	62,000 platinum metal; 29,000 palladium metal; 7,200 rhodium metal.
Do.	Lonmin plc		Marikana Mines (Eastern Platinum, Karee, and Western Platinum) near Rustenburg)	14,400 ore. ^c
Do.	kilograms	do.	do.	30,000 platinum; 14,000 palladium; 4,300 rhodium. ^c
Do.	do.		Limpopo Mine	1,000 ore. ^c
Do.	kilograms	do.	do.	1,800 platinum; 1,400 palladium; 280 rhodium. ^c
Do.	do.	do.	Precious Metals Refinery at Western Platinum	31,000 platinum metal; 14,000 palladium metal; 4,000 rhodium metal.
Do.	Marikana Platinum Mine (Anglo American Platinum Corp. Ltd., 50%, Aquarius Holdings Ltd, 20%)		Marikana Mine	3,000 ore.
Do.	kilograms	do.	do.	4,000 platinum; 1,900 palladium; 670 rhodium.
Do.	Everest South Platinum Mine (Aquarius Platinum Ltd., 50.5%, Impala Platinum Holdings Ltd, 20%)		Everest South Mine	3,000 ore.
Do.	kilograms	do.	do.	3,300 platinum; 1,900 palladium; 500 rhodium.
Do.	do.	Northam Platinum Ltd. (Anglo American Platinum Corp. Ltd., 22.5%, and Mvelaphanda Resources Ltd., 21.9%)	Northam Mine, 20 kilometers south of Thabazimbi	1,800 Merensky ore. 900 UG2 ore.
Do.	do.	do.	do.	7,900 platinum; 3,800 palladium; 700 rhodium.

See footnotes at end of table.

TABLE 2--Continued
SOUTH AFRICA: STRUCTURE OF THE MINERAL INDUSTRY IN 2006¹

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners		Location of main facilities	Annual capacity
Pyrophyllite	Idwala Industrial Minerals (Benoni)		Ottsdal Mine in North West Province	15.
Do.	Wonderstone Ltd. (The Associated Ore & Metals Corp. Ltd.)		Pyrophyllite (wonderstone) mine, North West Province	NA.
Do.	G&W Base and Industrial Minerals Pty. Ltd.		Piet Retief Mine	NA.
Silicon	Silicon Smelters (Pty) Ltd. (Anglo American plc; BHP Billiton Plc; Pechiney Metallurgie)		Polokwane plant, near Pietersburg, Limpopo Province	45 silicon metal.
Silver	metric tons	Rand Refinery Ltd.	Germiston, Gauteng Province	200 refined silver.
Synthetic fuels	thousand 42-gallon barrels	Sasol Ltd.	Coal to oil plant at Secunda and a coal to petrochemical plant at Sasolburg	54,800.
Do.	do.	Petroleum Oil and Gas Corporation of South Africa	Natural gas to petroleum products plant at Mossel Bay	18,300.
Tantalum	metric tons	Titan Processors (Pty) Ltd. (subsidiary of Pinnacle Resources Inc.)	Plant at Johannesburg	360 tantalum oxide.
Titanium:				
Titanium concentrates		Richards Bay Minerals (Rio Tinto Plc., 50%, and BHP Billiton Plc, 50%)	Open cast operations, near Richards Bay	1,280 ilmenite; 125 rutile. ^c
Do.		Namakwa Sands Ltd. (Anglo Operations Ltd., a subsidiary of Anglo American plc, 100%)	Mine near Brand-se-Baai and mineral separation plant at Koekenaap	540 ilmenite; 25 rutile.
Do.		Exxaro Resources Ltd.	Hillendale Mine near Richards Bay, KwaZulu Natal Province	550 ilmenite; 20 rutile; 5 leucoxene.
Titanium slag		Richards Bay Iron and Titanium (Pty) Ltd./Richards Bay Minerals (Rio Tinto Plc.)	Smelter at Richards Bay	1,000 titanium slag; 110 rutile.
Do.		Namakwa Sands Ltd.	Smelter at Vredenberg, Saldanha Bay area	200 titanium slag.
Do.		Highveld Steel and Vanadium Corp. Ltd.	Steel plant at Witbank	48 titanium slag. ^c
Do.		Exxaro Resources Ltd.	Empangeni smelter near Richards Bay, KwaZulu Natal Province	250 titanium slag.
Uranium oxide	metric tons	AngloGold Ashanti Ltd.	Vaal Rivers operation, near Klerksdorp	3,000.
Vanadium pentoxide	do.	Highveld Vanadium and Chemicals Division (Anglo American plc through Highveld Steel and Vanadium Corp. Ltd.)	Mapochs Mine near Lydenburg	17,500.
Do.	do.	do.	Plant at Witbank	10,800.
Do.	do.	Xstrata plc	Rhovan Mine at Brits	10,600.
Do.	do.	Vametco Minerals Corp. (Strategic Minerals Corp., 100%)	Krokodilkraal Mine and plant near Brits	5,400.
Do.	do.	Transvaal Alloys Pty. Ltd. (Highveld Steel and Vanadium Corp., 100%)	Wapadskloof Mine and plant, 60 kilometers northeast of Middelburg	2,250. ^c
Vermiculite		Palabora Mining Co. Ltd.	Palabora Mine and plant at Phalaborwa	223.
Zinc		Zinc Corp. of South Africa Ltd. (Exxaro Resources Ltd., 100%)	Struisbult Springszinc refinery at Springs, southeast of Johannesburg	110 refined zinc; 170 sulfuric acid.
Do.		Black Mountain Mineral Development Co. (Pty) Ltd.	Black Mountain Mine near Aggeneys	41 zinc in concentrate.
Zirconium		Tisand (Pty) Ltd./Richards Bay Minerals	Open cast mines near Richards Bay	300 zircon in concentrate.
Do.		Namakwa Sands Ltd.	Mine near Brand-se-Baai and mineral separation plant at Koekenaap	125 zircon in concentrate.
Do.		Exxaro Resources Ltd.	Hillendale Mine near Richards Bay, KwaZulu Natal Province	45 zircon in concentrate.
Do.		Palabora Mining Co. Ltd.	Palabora Mine and plant at Phalaborwa	14 baddeleyite. ^c
Do.		do.	Zirconium sulfate plant at Phalaborwa	8 zirconium sulfate.
Do.		Phosphate Development Corp. Ltd. (Foskor Ltd.) [Industrial Development Corp. Ltd. (IDC), 100%]	Plant at Phalaborwa	8 baddeleyite. ^c
Do.		do.	Fused zirconia plant	6 synthetic zirconia.

^cEstimated. NA Not available.

¹Based on information available as of February 2008.

²Source: American Bureau of Metal Statistics.

³Most of Foskor's phosphate output is from phosphate concentrates supplied by the neighboring Palabora copper mine.

TABLE 3
SOUTH AFRICA: RESERVE BASE OF MAJOR MINERALS IN 2006¹

(Million metric tons unless otherwise specified)

Commodity	Reserve base
Andalusite ²	51
Antimony	thousand metric tons 200
Chromium, ore	5,500
Coal, recoverable	27,981
Cobalt	thousand metric tons 15
Copper	13
Fluorspar	80
Gold	thousand metric tons 36
Iron ore	1,894
Lead	3
Manganese, ore	4,000
Nickel	12
Phosphate rock, concentrates	2,500
Platinum-group metals	thousand metric tons 70
Titanium minerals	220
Uranium	thousand metric tons 341
Vanadium	12
Vermiculite	80
Zinc	15
Zirconium	14

¹Metallic minerals are contained metal.

²Includes the aluminosilicate and sillimanite.

Source: Mwape, P., Roberts, M.J., Mokwena, E., Musi, L., Tjatjie, T., Phale, M., Baloyi, R., Mailula, D.T., and Kwata, P.G., 2007, General review, *in* South Africa's Mineral Industry 2006/2007: Johannesburg, South Africa, Department of Minerals and Energy of the Republic of South Africa, 27 p.